NEW YORK

ACADEMY OF SCIENCES

Third Annual Reception

and **Exhibit** of

Recent Progress in Science

in the

American Museum of Natural History

March 26th

1896

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New York Academy of Sciences.

FOUNDED IN 1817.

ORGANIZATION.

The Academy is fourth in point of age among the American scientific societies. It was organized in 1817 as the Lyceum of Natural History, and the present title was adopted in 1876. The constitution and organization are designed to make the Academy broadly representative of Science. The meetings and publications of the Academy are therefore open to all departments of scientific research.

The former Presidents have been: Dr. Samuel L. Mitchill, 1817–1823. Professor John Torrey, 1824–1826; 1836. Major Joseph Delafield, 1827–1837; 1839–1865. Professor Charles A. Joy, 1866–1867. Professor John S. Newberry, 1868–1892. Professor O. B. Hubbard, 1892–1893. Dr. H. Carrington Bolton, 1893–1894. Professor John K. Rees, 1894–1896.

MEMBERSHIP.

Honorary Members are limited to fifty in number, and are elected from the representative scientific men of the world. Corresponding Members are also chosen from distinguished men in different parts of the world who engage in the prosecution of some branch of research, the results of which they are expected to communicate to the Academy from time to time. This list now includes over 300 names.

Fellows are chosen from among the Resident Members, in recognition of scientific attainments or services; they form the Council and the main working body, and conduct the business of the Academy.

Resident Membership is not restricted to specialists, but is open to those who take a general interest in science and desire to promote the work of the Academy by their subscriptions.

The Initiation Fee is $5, and the annual dues are $10. Payment of these confers upon Members full privileges and the right to all publications. By payment of $100 a Member may become a Life Member, commuting his annual dues. Donors of $250 become Patrons, and have all the privileges of Life or Resident Members.

Resident and Corresponding Members are elected as follows: The candidates are proposed publicly, in writing, at any meeting, by a Fellow or Member; and the nominations, together with the name of the person making them, are referred to the Council; if approved, the candidates may be elected by ballot at any succeeding business meeting.

PUBLICATIONS.

The publications of the Academy at present consist of three series—*The Annals*, *The Transactions* and *The Memoirs*. Both are distributed to Members and Fellows, and are circulated in exchange for the publications of nearly all the foreign Academies and learned Societies. The Annals opened in 1824 and are now in the ninth volume of the second series; altogether nineteen volumes have been issued. They contain the longer contributions and reports of researches, and have given world-wide reputation to the Academy. The Transactions were begun in 1881; they contain a record of the meetings, including abstracts of the shorter papers, and are now in the thirtieth volume. The Transactions appear regularly in signatures, or are sent in complete octavo volumes at the end of the year, according to the wishes of Members. Under the present system of printing, an author can secure immediate publication and distribution of a discovery in which it is important to establish priority. The present edition of both the Annals and Transactions is 1000. The Memoirs are issued in quarto form and are adapted to papers requiring large plates or tabulations. They were begun in the current year and one number has been already issued.

LIBRARY.

The Library numbers over 18,000 titles, and is especially rich in sets of the publications of American and Foreign Societies. In this respect it is one of the most complete in this country. It is now shelved in a special room of the Library building at Columbia College, and is accessible to Members from 8 A. M. to 10 P. M., every day of the year.

MEETINGS.

The Academy at present enjoys the hospitality of Columbia College in the use of Hamilton Hall. There is, however, no official connection between the Academy and the College. Meetings are held every Monday at 8 P. M., from October to May inclusive. One evening of the month is given to a general business and scientific session. The other evenings are given to the Astronomical and Physical, Biological (Physiology, Zoölogy, Botany), Geological and Mineralogical sections. Other sections may be formed by a vote of the Council and one is now being organized in Philology and Philosophy. Each of the Sectional evenings is devoted mainly to respective papers and discussions. All the meetings are open to the public and are announced with the subjects of the papers to be read in the bulletins of the Scientific Alliance of New York.

POPULAR LECTURES.

The Academy is largely aided in its scientific work by its general membership, and the course of illustrated popular lectures arranged for each winter is specially for the benefit of the general Members and of the public. The subjects of the lectures are chosen from different branches of science, and are designed to present in a popular manner the latest results of research. Each member receives two Course tickets, and additional tickets can be procured. During the present year, 1895–6, the lectures are being delivered in the large lecture room of the Columbia Law School.

Persons desiring to join the Academy or support its scientific work by subscription should address,

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New York Academy of Science,
COLUMBIA UNIVERSITY, NEW YORK CITY.

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(Organization not perfected before the Reception.)

ASTRONOMY.

A

In Charge of Harold Jacoby.

1. Photographs Illustrating Objects Discovered at Harvard College Observatory. Exhibit of Harvard College Observatory, E. C. Pickering, Director.
   1. Harvard College Observatory, Cambridge Station.
   2. Arequipa Station, elevation 8,060 ft. El Misti in the background.
   3. Summit of El Misti, elevation 19,200 ft.
   4. Meteorograph on El Misti, records temperature, pressure, moisture, direction and velocity of wind for three months without winding.
   5. Bruce Photographic Telescope, aperture 24 inches.
   6. Removal of Bruce Telescope to Peru.
   7. Meteor trail. Arequipa, September 6, 1895.
   8. No. 7, enlarged 6 times.
   9. Portion of Moon.
   10. Jupiter, Saturn.
   11. Nebulosity surrounding η Carinæ, exposure 14 hours.
   12. Cluster ω Centauri, exposure 6 hours. Contains 30 variable stars.
   13. Cluster in Canes Venatici [N. G. C. 5272]. Contains 87 variable stars.
   14. Cluster in Serpens [N. G. C. 5904]. Contains 46 variable stars.
   15. Cluster in Serpens [N. G. C. 5904]. Taken two hours later than No. 14 and showing change in brightness of several of the stars.
   16. Cluster in Sagittarius [N. G. C. 6656]. Contains 4 variable stars.
   17. New Star in Perseus, 1887.
   18. New Star in Norma, 1893.
   19. New Star in Carina, 1895.

20. New Star in Centaurus, 1895.
21. Spectra of Stars in vicinity of η Carinæ.
22. Spectra of Stars in cluster in Carina [N. G. C. 3532].
23. Discovery of new variable stars from their spectra.
24. New Algol variable in Delphinus.
25. Light curves of variable stars.

2. PHOTOGRAPHS of Planetary Spectra made with the Spectroscope of the Allegheny observatory. Exhibit of Prof. J. E. Keeler, Allegheny, Pa.

These photographs were made either for the purpose of determining the relative motion in the line of sight of different parts of the surface of a planet, or for determining whether it is possible to detect the existence of an atmosphere around a planet by absorption lines in its spectrum.

1. Spectrum of Jupiter, region of Hγ, October 16, 1892. No comparison spectrum.
2. Spectrum of Jupiter; region of yellow green, February 24, 1895. Sky spectrum for comparison. Original negative.

The obliquity of the planetary lines is due to the rotation of Jupiter.

3. Positive Copy of (2).
4. Spectrum of Jupiter; region of D, February 26, 1895. Sky spectrum for comparison.

This spectrum extends far *below* the principal water-vapor band δ, which, however, does not appear on the photograph, as the negative was developed for the D lines.

5. Spectrum of Saturn; focus on λ 5352. April 9, 1895. Lunar comparison spectrum. Original negative. First measurement of relative velocities in the system of Saturn. (*Astrophysical Journal*, May and June, 1895.)
6. Spectrum of Saturn, April 28, 1895. Positive copy.
7. Spectrum of Venus, April 23, 1895, with simultaneously photographed sky spectrum. The planetary lines are displaced slightly toward the violet by the approaching motion of Venus.

8. Spectrum of Venus, with simultaneously photographed sky spectrum, November 12, 1895. This photograph was made with a diffraction grating (3d spectrum, $H\gamma$) and a camera of 28 in. focus, and shows the highest dispersion that it has been practicable to use so far. Made in connection with experiments, not yet completed, on the possibility of determining the rotation period of Venus by spectroscopic methods.
9. Solar Spectrum, same apparatus as for No. 8, showing the definition of the instrument under favorable circumstances.
10. Enlargement of Spectrum of Saturn, April 17, 1895.
11. Enlargement of Spectrum of Saturn, region of $H\gamma$, May 16, 1895. By Prof. W. W. Campbell, with the Lick Spectrograph. (*Astrophysical Journal*, August, 1895.)

3. Six-inch Equatorial Telescope. New Model.
4. Improved Filar Micrometer.
5. Photographs of Large Equatorials.

Nos. 3–5 exhibited by Messrs. Warner & Swasey, Cleveland, O.

6. Spectroscope to fit six-inch equatorial.
7. Very small Spectroscope.
8. Helioscope.
9. Telescope Objectives.
10. Accurate Plane and Parallel Surfaces.

No. 6–10 exhibited by J. A. Brashear, Allegheny, Pa.

11. Microscope Theodolite, by Wannschaff of Berlin, made 1895.
12. Lantern Slides from original negatives of the following objects:
    1. Eta Argus, from negatives made at the Cape of Good Hope Observatory by C. Ray Woods, under the direction of Dr. Gill. Exposure times vary from five minutes to twenty-five hours. For comparison, Herschel's drawing of 1834 will be shown.

2. Variable star in Vela, several photographs, showing the variation of the star.
3. Specimen plates of the Astro-photographic Catalogue and Chart work at the Cape of Good Hope Observatory.

Nos. 11 and 12 exhibited by Columbia University Observatory, J. K. Rees, Director.

PHYSICS.

B

In Charge of William Hallock.

1. Dibdin Pentane Lamp. Exhibited by Alexander C. Humphreys. The Standard of illumination adopted in London. It is approximately equal to 10 candles.

2 Polariscope, special form designed by Prof. A. M. Mayer. Exhibited by the Department of Physics, of Columbia University.

3. Two Mirror Heliostat. Designed by Prof. A. M. Mayer. Exhibited by the Department of Physics, of Columbia University.

4. Apparatus for Showing the Vibration of a String. Designed by Prof. W. L. Robb. Exhibited by O. N. Rood.

5. Apparatus for Voice Analysis. A modification of the Kœnig apparatus, with photographic record. Accompanied by a set of corresponding organ-pipes.

6. Photographs of the same vowel in typical voices.

7. Photographs of different vowels in the same voice.

8. Apparatus for Photographing the Vocal Cords in Action. A combination of laryngoscopic mirror, special Camera and Shutter.

9. Photographs of Vocal Cords in Action on Different Pitches. Showing the rotation of the aretynoid cartilages and consequent shortening of the vibrating length of the cords.

Nos. 5–9, exhibited by W. Hallock and F. S. Muckey.

10. Röntgen Photographs. Exhibited by W. L. Robb, W. W. Griscom and W. Le Conte Stevens.

11. Röntgen Photographs and Apparatus. Exhibited by O. N. Rood.

12. Pseudo-Röntgen Photographs. Exhibited by H. S. Curtis. Made by sunlight through an ebonite slide.

13. Mahler's Modification of Berthelot's Calorimeter. Exhibited by J. Struthers.

14. Thompson's Calorimeter. Exhibited by J. Struthers.

15. Lovibond Tintometer. Exhibited by C. F. Chandler.

16. Micro-Sterograph. Exhibited by O. N. Rood. Taken by a special method.

17. Modification of Regnault's Specific Heat Apparatus. Exhibited by the Department of Physics, of Columbia University.

ELECTRICITY.

C

In Charge of M. I. Pupin.

1. Apparatus for studying long electric waves, and curves, plotted from experimental data, illustrating the distribution of long electric waves along a conductor. Exhibited by Prof. M. I. Pupin.

An alternating electric current is propagated along a long conducting line, say a telephone wire, by a series of progressive waves. The exhibit represents an artificial conductor of 500 miles in length corresponding to a long distance telephone line of the same length and the meas-

urements obtained with it represent the first experimental data that have ever been obtained in this field of electric research.

2. Apparatus for studying the magnetic lag in closed magnetic circuits and diagrams, plotted from experimental data, recording the results obtained. Exhibited by Chas. T. Rittenhouse, Fellow in Electricity, Columbia University.

   When iron is magnetized by a rapidly varying force the magnetization does not keep in step with the force, but lags behind it. This lag is due to induced currents in the mass of the iron and to internal viscosity; it is especially strong in closed magnetic circuits, and increases with the increase of the speed of the magnetizing force, but diminishes with the increase of temperature.

3. Apparatus employed for generating the radiant energy discovered by Professor Röntgen. Exhibited by Prof. M. I. Pupin.

   A rotating current interruptor and induction coil and different types of Crooke's and electrodeless tubes.

4. Silhouettes or Radiographs obtained by the Röntgen method. Exhibited by several physicists whose names are attached to the several exhibits.

CHEMISTRY.

D

In Charge of C. E. Pellew and Morris Loeb.

1. Argon and Helium. Exhibited by Charles E. Pellew and Samuel A. Tucker.

   Argon and Helium are two newly discovered elements of the Nitrogen group. Argon occurs in minute particles in the atmosphere.

   Helium was first discovered by the spectroscope, in the atmosphere of the sun, and more recently has been prepared in bulk from Monazite and other minerals.

The exhibit shows tubes of Argon and Helium, rendered incandescent by the electric spark, so as to exhibit the characteristic spectra.

Also tubes containing large amounts of Helium, and the apparatus for preparing Helium from Monazite.

2. Norman Heptyl Sulfocyanide. Exhibited by Marston T. Bogert, of the Department of Organic Chemistry, School of Mines, Columbia University.

This compound, hitherto unknown, was prepared by the exhibitor in January, 1896. Its graphic formula is:

$CH_3 . (CH_2)_6 . SCN.$
Sp. Gr. = 0.931 @ 15° C.
B. P. = 230–234° C.

When freshly distilled, it forms a colorless oil, which gradually turns yellow when exposed to light and air.

PHOTOGRAPHY.

E

In Charge of Cornelius Van Brunt.

1. Anti-Halo, for preventing halation, with plate coated and plates showing the difference.

2. Meta-carbol, a new developing material, with bottle of developer and negatives.

3. Stipple Plates, the use of which will prevent retouching. These are to be used in contact with the plates during exposure in the camera, with prints illustrating the same.

4. Olmsted's Lantern slide mats, from which any design or size of Mat can be cut without the aid of a ruler.

5. Wynne's Exposure Meter, a pocket apparatus for giving the correct time of exposure.

6. Dalmeyer Bergheim Portrait Lense.

7. Dalmeyer Stigmatic Lense.

Nos. 1–7 exhibited by E. and H. T. Anthony.

8. New Photographic Apparatus. Exhibited by Scoville & Adams Co.

9. High-class and Novel "Projection Apparatus." Exhibited by J. B. Colt & Co.

10. New Lanterns and apparatus. Exhibited by Charles Beseler.

11. Samples of Artotype, in color.

12. Samples of Facsimile.

Nos. 11 and 12 exhibited by Edward Bierstadt.

13. Photo-micrographs, in three colors. Exhibited by Edw. Leaming, M. D.

14. 24 Photographs of "Lightning." Exhibited by W. N. Jennings.

1. First photograph of lightning ever taken, to prove that the discharge is *wavy*, not *zigzag*, as usually represented by artists. Taken September 2, 1882, at Philadelphia.

2. Photograph clearly demonstrating the truth of the "wavy line" theory of lightning.

3. Artificial lightning (Holtz machine discharged) for comparison with real "Jersey Lightning."

4. Divided discharge (forked lightning).

5. "Branched" lightning, explaining "tree marks" often found upon the bodies of persons struck by lightning.

6. Artificial "branched" discharge (the spark from a Holtz machine flashed directly across the face of the photographic plate, no lens being employed).

7. Parallel discharges. Stratification due to movement of conducting path by the wind.

8. Holtz machine "Brush" discharge (Photographic plate being placed horizontally between the electrodes), showing *electric* "lines of force."
9. Holtzmachine spark (plate being placed vertically between the electrodes), showing *electric* "lines of force."
10. Meandering discharge. Illustrating the service of trees during a thunder storm—to dissipate, neutralize or conduct the discharge.
11. "Beaded" or "Rosary" lightning. Supposed to be the track of a rotating ball of fire moving through space. A "thunderbolt."
12. "Beaded" or "Rosary" lightning.
13. Two parallel discharges branching from a main stem.
14. Radial lightning. The discharge having the appearance of heat-cracked glass.
15. Collision of two discharges in mid-air, and the production of "thunderbolts."
16. "Ribbon" lightning. (An oscillating discharge moved by the wind.) Caught on the prairie of North Dakota at midnight from the rear platform of an express train.

15. Reproduction of the Three Color Process. Negatives and plates untouched by hand. Examples are from Life, Nature, Still Life, Paintings, produced by the N. Y. Photogravure Company. Exhibited by Ernest Edwards.

16. Radiographs with "Roentgen" Rays, and other photographs. Exhibited by John S. McKay.
    1. Photographs of Apparatus used in producing Röntgen rays.
    2. Radiographs of hand containing bullet. Frog with broken leg. Bird with shot in body.
    3. Radiographs showing skeletons of small animals. Frog, turtle, salamander, etc.
    4. Radiographs showing relative capacity to "Röntgen rays" of various solids and liquids.

5. Electrographs of Coins taken in the dialectric of a condensor.
6. Photograph of bottom of developing tray broken in a dark room, upon plates which had been exposed to "Röntgen" rays.
7. Radiographs of a Key taken at more than six feet from vacuum tube.

17. Arc Lamp for Photography, which operates under conditions of absolute steadiness for all photographic purposes.

18. Screen for diffusing light, assuming many different shapes by a touch.

Nos. 17 and 18 exhibited by the International Lamp Co.

GEOLOGY.

F

In Charge of J. J. Stevenson.

1. Suite of Ores, Rocks and Photographs from Cripple Creek, Colorado. Exhibited by Prof. J. F. Kemp. The ore deposits are oftenest associated with dikes of phonolite or nepheline-basalt that penetrate the red granite of the Pike's Peak region, or a decomposed breccia of andesite. They also line in veins which fill more or less irregular fissures in the andesite breccia away from dikes. The ores are fresh or decomposed telluride of gold.

   This district was described before the Academy, February 7, 1896.

2. Suite of Ores, Rocks and Photographs from the Bertha and Wythe Zinc mines, in southwest Virginia. Exhibited by Prof. J. F. Kemp. The Siluro-Cambrian limestone has been originally charged with zinc blende and pyrites at the Bertha mines, and with these and galena at the Wythe mines. It has decomposed, leaving a residual

clay. The zinc blend has yielded calamine, a hydrated silicate of zinc, that has leached down and formed incrustations on the undecomposed limestone.

These mines were described to the Academy November 18, 1895.

3. Suite of Specimens from Essex County, N. Y., showing the development of crushed and brecciated rocks and gneisses from originally massive igneous forms. Exhibited by Prof. J. F. Kemp. The specimens are the labradorite rock and gabbros from the Adirondacks. No. 1 shows a massive, coarsely crystalline aggregate of dark crystals of labradorite from Lake Sanford; in No. 2 and following numbers the minerals are more and more crushed until only a pulp of the original rock is left in No. 13. Nos. 14–19 show the development of gneissoid forms; Nos. 20 and following exhibit the passage of massive gabbro into hornblende gneiss. The changes were brought about by dynamic metamorphism.

4. Series of Rock Specimens, Maps and Photographs illustrating the geology of Mount Desert Island, Maine, and vicinity. Exhibited by Theodore G. White, Geological Department, Columbia University.

This embraces the original metamorphosed, unfossiliferous slates, through which the following rocks were ejected: The red granite, forming the central core of the island; rhyolites, varying in type and structure; representatives of a few of the dikes; ores and associated rocks from the Blue Hill and Cape Rosier, Maine, copper mines; contorted quartzose schists from Blue Hill.

5. Set of Rocks from the southern portion of the Boston Basin, Mass., collected by Prof. W. O. Crosby. Exhibited by Theodore G. White.

This series embraces the *Paradoxides* slates of Braintree; the Quincy hornblendic granite; biotitic granite; diorites and dioritic granites; flow and porphyritic

rhyolites of the Blue Hills and their gradations; the melaphyr outflow and accompanying conglomerates of Hough's Neck; selections from the dikes.

6. Series of Specimens from Montreal, Canada. Collected and exhibited by Theodore G. White.
   1. Mile-End quarries; Trenton and Chazy limestone. 2. Corporation quarries; elæolite syenite and associated limestone, slates, granites and dikes. The elæolite syenite here cuts the Trenton limestone and is older than the Helderberg, because boulders of it are found in the Helderberg conglomerate.

7. Bauxite and Associated Clays from northwestern Georgia and northeastern Alabama with photographs of the mines. Exhibited by Heinrich Ries.
   This material, which is used for the manufacture of alum and aluminum, occurs in a belt about 40 miles long. Its formation is due to the action of hot springs.

8. Dikes from Dorset Mt., Vt. Exhibited by Heinrich Ries. These dikes are found in the marble quarries at several points.

9. Variegated Marbles from Swanton, Vt. Exhibited by Heinrich Ries.

10. A series of Gneissic Rocks and Dikes from the Highlands of Orange Co., N. Y. Exhibited by Heinrich Ries.
    The Highlands of Orange Co., N. Y., are composed of a series of gneisses and gneissic rocks with occasional interbedded limestones and deposits of magnetite. These rocks are cut by many dikes of diabase and diorite. They will be described in the report of the State Geologist for 1895.

11. Kaolins from North Carolina, collected by J. A. Holmes. Exhibited by Heinrich Ries.

12. Porphyritic Gneiss and Intrusive Rocks of the Cortlandt series from Bedford village, Westchester Co., N. Y. Exhibited by L. M. Luquer and Heinrich Ries.

This peculiar phase is marked with the development of phenocrysts of feldspar. They were furthermore penetrated by gabbroitic rocks. These latter represent a new and undescribed extension of the Cortlandt series to the eastward.

13. Series of Coals from Madrid, New Mexico. Exhibited by Prof. J. J. Stevenson.

    These are from the Old Placer coal field and show the passage from bituminous to anthracite coal.

14. Specimens of Asphalt from Indian Territory. Exhibited by Prof. J. J. Stevenson.

    This material is obtained from the Upper Carboniferous beds of south-central Indian Territory.

15. A series of Lead and Zinc Ores from Joplin, Mo. Exhibited by Prof. J. J. Stevenson.

16. A series of Rock Salt Specimens, collected from central New York by C. Q. Freeman. Exhibited by Prof. J. J. Stevenson.

MINERALOGY.

G

In Charge of Edmund Otis Hovey.

1. Lorandite, with Realgar, Macedonia. A compound of Tl, As and S, a new mineral.

2. Olivenite, Centennial Mine, Tintic Dist., Utah. Very fine crystals.

3. Sylvanite, Cripple Creek, Colorado.

4. Griphite, Riverton Lode, near Harney City, S. D. A rare, problematical phosphate of Al, Mn, Ca, Na, etc.

5. Argyropyrite and Pyrargyrite, Freiberg, Saxony.

6. Lithiophorite, Rengersdorf, Germany. A manganese ore containing lithium.

7. Powellite, Calumet, Mich. A new locality for this rare mineral.

8. Aegirite, Langesund, Norway. A fine, large crystal.

9. Epistilbite, Bernfiord, Iceland.

10. Opal, Frankenstein, Silesia. Green.

11. Cassiterite, Lake Titicaca, Bolivia.

12. Kylindrite, Santa Cruz Mine, Poopé, Bolivia. $Pb_6Sb_2Sn_6S_2$. A new mineral.

13. Sulphur, Japan. Contains tellurium.

14. Barite, Silver Plume, Colorado. A large crystal.

15. Barium-Feldspar, Grythyltan, Sweden.

16. Asbeferrite, Grythyltan, Sweden. An iron-manganese amphibole.

17. Ganomalite, Nordmarken, Sweden. A rare silicate of lead, calcium and manganese.

18. Manganhisingerite, Silfberg, Sweden.

19. Manganapatite, Horrsjoberg, Sweden.

20. Manganbrucite, Nordmarken, Sweden.

21. Manganostibiite.

22. Biharite, Rezbánya.

23. Carphosiderite, Romanche, France.

24. Veszelyite, Vaseo.

25. Wad, Romanche, France. Var. *Groroilite.*

26. Muscovite, Lincoln Co., N. C. Transparent green crys tals.

27. Apophyllite, Paterson, N. J.

28. Zircon, Ceylon. Cut gems.

29. Andalusite, Brazil. Cut gem.

30. Ruby, Paris, France. Artificial production.

31. Whewellite, Zwickau, Saxony.

32. Thaumasite, Areskutå, Sweden. From the original locality. Compare with that from West Paterson, N. J., recently discovered.

33. Calcite, Richelsdorf, Hesse. Calc-sinter colored by cobalt.

34. Calcite, Richelsdorf, Hesse. Calc-sinter colored by copper.

35. Crocidolite, Cochabamba, Bolivia. New locality.

36. Gold, Verespatak, Hungary.

37. Phosgenite, Monte Poni, Sardinia. On galenite.

38. Melanophlogite, Ragalmuto, Sicily. On sulphur.

39. Lautite, Nr. Marienberg, Saxony. With arsenic.

40. Pholerite, Kohlendorf, Sweden. A form of kaolinite. With millerite.

41. Galenobismutite, Falun, Sweden. Contains selenium.

42. Tellurium, Nagyág, Transylvania. With nagyagite.

43. Talc, Thiersheim, Bavaria. Pseudomorph after quartz.

44. Talc, Thiersheim, Bavaria. Pseudomorph after dolomite. A collection illustrating the association of minerals in the pegmatite veins near Bedford, N. Y.

45. Uraninite and Uranotile.

46. Autunite.

47. Menaccanite (Ilmenite).

48. Tourmaline.

49. Garnet.

50. Quartz, *a*, White.

51. *b*, Rose.

52. *c*, Smoky.

53. FELDSPAR.

54. FELDSPAR and QUARTZ intergrowth forming "Graphic granite."

55. FELDSPAR "augen" in gneiss.

56. MUSCOVITE.

57. BIOTITE.

Nos. 1 to 57 exhibited by the Mineralogical Department of Columbia University, through Prof. Thomas Egleston and Dr. Lea McI. Luquer.

58. ORTHOCLASE, very large crystals, with specimens of associated minerals from veins of coarse pegmatite on the north shore of Long Island Sound.

Collected (1895) and exhibited by Prof. J. F. Kemp, Columbia University.

59. TOURMALINE. Bethel, Conn. A very large crystal. Exhibited by Prof. E. S. Dana, Yale University.

60. FEDOROW UNIVERSAL MICROSCOPE STAGE, combined with the KLEIN "UNIVERSAL-DREHAPPARAT;" made by R. Fuess in Berlin after the plans of Prof. E. von Fedorow, of Moscow, and Prof. C. Klein, of Berlin.

This apparatus, if placed on the stage of a polarizing microscope, allows the object, whether a thin section of a rock or mineral or a small crystal, to be placed at almost any angle to the axis of the microscope, for by means of the two axes of revolution, in addition to the usual horizontal revolution of the stage of the microscope about the axis of the instrument, we are able to revolve the object about three axes at right angles to each other, and hence bring almost any direction in it parallel to the axis of the microscope, subject of course to the necessary limitations to the extent of the motion which the condi-

tions impose. This is especially useful in studying the optical properties of minerals in thin sections, as illustrated by the present arrangement of the instrument and the first cut accompanying it.

The other part, the "Universal Drehapparat," consists of a small glass vessel for holding a highly refracting fluid in which the section or crystal is immersed after being fastened on a small movable holder which permits adjustment to the axes of revolution of the apparatus. The microscope is placed horizontally, as shown in the second cut, and the observations made with the same possibility of revolution on three axes, whether for optical study or the measurement of the angles of crystals. A special long focus condensing lens and similar objective accompany the instrument, which allow space for the revolution of the object.

Exhibited by the Department of Mineralogy and Petrography of Harvard University through Prof. J. E. Wolff.

62. DANBURITE, Russell, N. Y. Twelve specimens showing the variation in form.

63. TOURMALINE, *a*, white, DeKalb, N. Y.

64. *b*, yellow, DeKalb, N. Y.

65. *c*, brown, Gouverneur, N. Y.

66. *d*, black, Pierrepont, N. Y.

67. WERNERITE, Pierrepont, N. Y.

68. WERNERITE, Bedford, Ontario.

69. WERNERITE, Burgess, Ontario.

70. APATITE, Burgess, Ontario.

71. APATITE, Eganville, Ontario.

72. APATITE, Bedford, Ontario.

73. TREMOLITE, Gouverneur, N. Y.

74. HORNBLENDE, Russell, N. Y.

Nos. 62 to 74, fifty specimens, exhibited by Prof. A. H. Chester, Rutgers College.

75. PYROXENE, Tilly Foster mine, Brewster's, N. Y. A new form and very large for this locality.

76. CARBIDE OF ALUMINUM, crystals formed in an electrical furnace.

Nos. 75–76, exhibited by Heinrich Ries.

77. THE PHOSPHORESCENCE OF THE DIAMOND. Apparatus designed to show this peculiar feature of some stones by electric arc light. The phenomenon is thought to be due to the presence of a new hydrocarbon compound to which the name *tiffanyite* has been given. A phosphorescent liquid is introduced for comparison, and some non-phosphorescent diamonds for contrast. Exhibited by George F. Kunz.

78. APOPHYLLITE, Bernfiord, Iceland. Crystals showing the planes, *001*, *100*, *310*, *111*, *112*.

79. HEULANDITE, Bernfiord, Iceland. Crystals showing *010*, *001*, *110*, *201*, $\bar{2}01$, *021*, $\bar{1}11$.

80. STILBITE, Bernfiord, Iceland.

81. MUSCOVITE. Henry Lincoln Co., N. C. Crystals.

82. PHENACITE, Mt. Antero, Colorado. Twinned crystals.

83. PHENACITE, Mt. Antero, Colorado. Shows basal plane.

84. CHABAZITE, West Paterson, N. J. Shows basal plane.

Nos. 78 to 84 exhibited by Lazard Cahn.

Specimens from a new locality at West Paterson, N. J.:

85. HEULANDITE and APOPHYLLITE, two specimens belonging together.

86. HEULANDITE, large aggregation in the form of a geode.

87. HEULANDITE and CHABAZITE.

88. HEULANDITE, red and white in one aggregation.

89. HEULANDITE, individual crystals.

90. HEULANDITE, *a*, green.

91. *b*, white.

92. *c*, red.

93. ANALCITE on PECTOLITE.

94. APOPHYLLITE, large group of primitive crystals.

95. APOPHYLLITE, primitive crystals.

96. APOPHYLLITE, two large modified crystals.

97. CALCITE, twin showing an etched face.

98. CALCITE, cleavage piece.

99. CHABAZITE, *a*, brown.

100. *b*, white.

101. *c*, green.

102. *d*, red.

193. DATOLITE with PREHNITE.

104. LAUMONTITE.

105. LAUMONTITE with twinned calcite.

106. PREHNITE, distinct crystals, very rare.

107. PECTOLITE.

108. PECTOLITE, sections of a sphere coated and cemented with calcite and quartz.

109. PECTOLITE.

110. QUARTZ, pseudomorph after pectolite, showing moulds of natrolite crystals.

111. NATROLITE.

112. STILBITE.

113. STILBITE, *a*, individual crystals.

114. *b*, sheaf-like form of aggregation.

Nos. 85 to 114 exhibited by A. H. Ehrman, Brooklyn.

115. Cyanite, Death Rapids, Columbia River, British Columbia. Extraordinarily large blades in schist. Collected (1895) and exhibited by Frank L. Nason, New Brunswick, N. J.

116. Hanksite, Borax Lake, California. A large cluster.

117. Bornite, North Carolina.

118. Quartz, Organ Mountains, N. M. Shows phantom.

119. Calcite, Burnet, Texas. Shows phantom.

120. Lignite, New Jersey. Contains siliceous casts of *Teredo navalis.*

121. Barite, New Brunswick, N. J. Orange colored crystals.

122. Pyrite Balls, South River, N. J.

Nos. 116 to 122 exhibited by John A. Manley, New Brunswick, N. J.

123. Tourmaline, 171st street and Ft. Washington avenue, New York City. An unusually large crystal in its matrix.

124. Xenotime, same locality. Three very large crystals in the matrix.

125. Monazite, same locality. A large crystal in its matrix and a detached group.

126. Xenotime, 184th street and Harlem River Speedway, New York City.

127. Azurite, Bisbee, Ariz.

128. Stalagmite, Bisbee, Ariz. From the famous cave in the Copper Queen mine.

129. Stalagmite, Bisbee, Ariz. Cut section, polished.

130. Helictites, Bisbee, Ariz. Strangely curved stalactites.

131. Quartz, Madrone, Santa Clara county, Cal. Two coatings of iridescent, drusy crystals.

Nos. 123 to 131, exhibited by the Department of Geology, Amer. Mus. Nat. Hist.

132. THAUMASITE, West Paterson, N. J. Described from this locality in the *American Journal of Science* for March, 1896, by S. L. Penfield and J. H. Pratt.

133. LORANDITE, Macedonia. A new thallium mineral.

134. TOURMALINE, Connecticut.
From recent finds in southwestern Missouri.

135. GALENITE, CALCITE and SPHALERITE, Joplin.

136. SPHALERITE, Carterville. Very light colored. Iridescent.

137. LEADHILLITE and CALAMINE, Granby.

138. CALAMINE, Aurora.

139. MARCASITE, Aurora. Stalactites of fantastic form.
Nos. 132 to 139 exhibited by Geo. L. English & Co.

140. LAWSONITE, Tiburon Peninsula, Marin Co., Cal. A newly described silicate of Ca and Al. Three groups of orthorhombic crystals showing variety of habit. *Vid.* Am. Jour. Sci., July, 1895.

141. NORTHUPITE, Borax Lake, California. A newly discovered chloro-carbonate of Na and Mg. Eight octohedral crystals exhibiting variety of marking and grouping. Described by W. M. Foote, in Am. Jour. Sci., December, 1895.

142. OPALIZED WOOD, Idaho. A recent discovery of material remarkable for the perfection with which all the structural peculiarities of the wood have been preserved. Six sections, three of which have been polished.

143. LEADHILLITE, Granby, Missouri. Three pseudomorphs after galenite and calcite.

144. CALCITE. Amethystine Iceland spar showing bands of included marcasite crystals.

145. CHALCOPYRITE, southwest Missouri. On dolomite (pearl spar).

146. Rutile in Quartz, San Francisco Riv., Brazil. "Flèches d' amour." Very fine.

147. Sphærostilbite, Oregon.

148. Chabazite, Oregon.

149. Thompsonite, Oregon.

150. Halite, Nr. Borax Lake, Calfornia. A suite of twelve transparent cubo-octahedral crystals.

151. Halite, Nr. Borax Lake, California. Two groups of pale yellow and pink cubic crystals showing peculiar cavernous faces.

152. Thenardite, Nr. Borax Lake, California. Two groups of unusually large crystals.

152. Hanksite, Nr. Borax Lake, California. Group of very large, brilliant crystals.

154. Dysanalyte, brilliant black crystals in gangue.

155. Opal, Washington State. Green mottled with red. Three specimens, one of which is polished; from a new locality.

156. Endlichite, Lake Valley, New Mexico. A rare variety of vanadinite in which arsenic has replaced half of the vanadium.

Nos. 140 to 156, forty-eight specimens, exhibited by Dr. A. E. Foote (W. M. Foote, Mngr.), Philadelphia.

156. Turquoise, Cerro de Potosi, Bolivia. Three pseudomorphs after orthoclase, simple and twinned.

158. Pyrite, Cerro de Potosi, Bolivia. Two pseudomorphs after orthoclase.

Nos. 157, 158 exhibited by Frederick A. Canfield, Dover, N. J.

PHYSIOGRAPHY.

H

In Charge of R. E. Dodge.

1. A collection of the best and more recent scientific school and college text-books on the subject of Physiography. Loaned by the publishers.
2. A collection of relief models loaned by E. E. Howell, maker, Washington, D. C.
   - *a*. Topographical model of the United States and adjacent ocean bottoms, showing curvature of the earth.
   - *b*. The same showing influence of physical features of the United States on the distribution of rainfall.
   - *c*. Topographic model of the State of Connecticut.
   - *d*. Topographic model of New Jersey.
   - *e*. The same colored to show the relation of the geology to the physical features.
   - *f*. Topographic model of the vicinity of Chattanooga, Tenn.
   - *g*. The same to show the relation of geology to physical features.
3. A collection of illustrative models for use in teaching.
   - *a*. Three models showing stages of development of topography in the down cutting of streams on a coastal plain.
   - *b*. Two models showing effects of depression and elevation upon a land well worn down previously.
   - *c*. Three models showing development of form and drainage in a region made by faulting, as in lava blocks of Oregon.
   - *d*. Two models showing effect upon topography and drainage of the oncoming of a glacier.
   - *e*. Six models showing development of topography and drainage in a land made by volcanic action and

then worn down after the volcanoes have become extinct.

f. Six models, in pairs, showing the interaction of neighboring streams in wearing down a region. Note adjustment of drainage to structure of rocks.

g. Three models showing formation of alluvial plain, the later conversion into a terraced valley and final removal of all loose material in the valley.

Exhibited by the Geological Department of Harvard University, through Prof. W. M. Davis, Chairman.

4. Maps.

a. Geological map of State of Alabama, showing relation of lands worn down in Cretaceous times to the surrounding unconformable Cretaceous sediments.

b. Map of the alluvial plain of the Mississippi showing many features typical of rivers in their old age. Note position of stream in the flood plain.

c. Relief map of New Jersey showing the physical features.

d. Geological map of New Jersey to be compared with above to note relation of the topography upon the character of the rocks.

e. Map of New Jersey showing water basins, illustrating the complete division of a land into river basins.

f. Map of the United States colored to show the relief and physical features.

g. Topographic map of Now York and vicinity to show the relation of the position of the city to the physical features and history.

h. Topographic map of Rhode Island showing effects of glaciation upon drainage and the recent changes in position of land in reference to ocean.

i. Four maps of the Coast and Geodetic Survey, showing different types of coasts upon the Atlantic seaboard.

Exhibited by the Teachers' College.

BOTANY.

I

In Charge of H. H. Rusby and J. K. Small.

1. Topographical Maps of the site of the New York Botanical Garden, in the eastern end of Bronx Park, now being used in the locating of the driveways, buildings and plantations. Shown by permission of the Board of Managers.

2. Elements of Plant Anatomy. A text-book for the use of students. Exhibited by Prof. Emily L. Gregory, Ph. D. (Barnard College).

3. Studies in American Bryology. Exhibited by Elizabeth G. Britton (Torrey Botanical Club).
   1. The Genus Mnium. Illustrated by specimens and microscopic preparations.
   2. New and little-known Mexican Mosses, collected by C. G. Pringle and Jared G. Smith.

4. Studies in Leguminosae. Specimens illustrating new species of Rhynchosia Galactia and Meibomia from North America. Exhibited by Anna Murray Vail· (Torrey Botanical Club).

5. Microscopic Preparations and Drawings illustrating a study of the Dorsiventrality of certain Climbing Organs. Exhibited by Martha R. Clarke (Barnard College).

   The cause of coiling in most tendril-climbers is believed to consist in a sensitiveness, usually limited to one side or flank of the coiling organ. In the most common instances there is an anatomical difference between the sensitive

and non-sensitive sides. This study was undertaken to ascertain to what extent the anatomical characteristics correspond with the physiology.

6. Stems, Microscopic Preparations and Drawings Illustrating Studies of the Superficial Periderm of the Genus Euonymus. Exhibited by Harriet B. Elder (Barnard College).

The woody portions of stems of the different species of a genus are quite similar in anatomical characteristics, as are also, to a certain extent, the bark portions. The genus Euonymus presents a remarkable exception to this rule, as shown by the external appearance of the young branches and by sections.

7. Microscopic Preparations, Drawings and Wall Charts Illustrating a Comparative Study of the Development of the Superficial Periderm in the Genus Salix. Exhibited by Alexandrina Taylor (Barnard College).

In most text-books the work of Sanio is taken as authority on the development of superficial periderm. From the large number of species of the genus Salix he selected one as a type. The many variations from this type pointed to the possibility that by extending the study over a greater number of species than those studied by Sanio, one might be found which might more justly be called the type of the genus. This was the object of the study here illustrated.

8. Microscopic Preparations and Drawings Illustrating a Study of the Epidermal Cells of the Leaf of Euonymus Japonicus. Exhibited by Jane M. Atwater (Barnard College).

The connection of protoplasm of cells of the endosperm of certain seeds is considered a well-established fact, and many botanists claim that the majority of living cells are thus connected. The pores on the side walls of the epidermis of this leaf suggested the probability of such protoplasmic connection.

9. Microscopic Preparations and Drawings Illustrating a Comparative Study of the Bark of Juglans cinerea at Different Seasons. Exhibited by Marion McEwen (Barnard College).

This study was undertaken in the interest of Research Committee C (investigating powdered drugs) of the Revision Committee of the United States Pharmacopœia, to discover characters in powdered Butternut bark, by which it could be determined whether it had been collected in the autumn as required.

10. Specimens of Seeds, Microscopic Preparations and Drawings Illustrating a Comparative Study of the Anatomy of the Strophanthus Seeds of Commerce. Exhibited by Prof. Smith Ely Jelliffe, M. D. (College of Pharmacy).

This study was undertaken under the same auspices as the last, for the purpose of discovering characters for distinguishing the different species and varieties of Strophanthus seeds in the powdered form. This drug is used in great emergencies, and some of the seeds of commerce are nearly or quite inert, while others are very powerful.

11. Specimens of Winter Twigs, Barks and Drawings Illustrating a Comparative Study of the Commercial Features of Viburnum Barks. Exhibited by Prof. Henry H. Rusby, M. D. (College of Pharmacy).

This study was undertaken under the same auspices as the preceding, in order to determine characters for the identification by collectors of the different species in the winter season, and also for identifying the barks in commerce, either entire or in powder.

12. Specimens of Plant and Fruit, Microscopic Preparations and Drawings, and Printed Report Illustrating a Study of the Anatomy of the Fruit of Serenoa serrulata (Saw-Palmetto). Exhibited by W. A. Bastedo, Ph. G. (College of Pharmacy).

This fruit has been recommended as favorably modifying nutrition in the wasting of phthisis, and a collective study was made by Messrs. Rusby, Coblentz and Bastedo, in order to make it more perfectly known to the pharmaceutical and medical professions.

13. Materials Illustrating a Study of Lichens. Exhibited by Albert Schneider, M. D. (Columbia University).

    1. Plates illustrating the mechanics, growth, and special morphology of lichens.
    2. A diagram showing the polyphyletic origin of lichens.
    3. The new system of lichens.
    4. A key to the families and genera.
    5. Specimens of lichens of historical interest.
    6. Microscopical preparations showing lichen-spores.
    7. Some papers on lichens.

14. Specimens, Microscopic Preparations and Drawings, illustrating a Study of the Anatomy of Stipules. Exhibited by A. A. Tyler, A. M. (Columbia University).

    Investigation undertaken to ascertain the probable origin of these organs and their relationship to leaf-blades.

15. Studies in American Cyperaceæ. Exhibited by Prof. N. L. Britton, Ph. D. (Columbia University).

    Specimens illustrating new species of Cyperus, Eleocharis and Rynchospora and other species new to the Flora of the United States.

16. The New Species of Nitalla from Japan and North America. Exhibited by Prof. Timothy F. Allen, M. D. (Homeopathic Medical College).

17. The New Genera of Saxifragaceæ, Jepsonia and Saxifragopsis, illustrated by specimens and drawings.

18. New Species of Plants from the Southern United States, in the genera Smilax, Myrica, Quercus, Celtis, Polygonella, Rumex, Portulaca, Nymphæa, Clematis, Saxi-

fraga, Ribes, Kneiffia, Œnothera, Nyssa, Cynoctonum, Gentiana, Scutellaria, Panicum and Sieglingia, illustrated by specimens.

19. Oxalis corniculata and its North American Allies, illustrated by specimens.

Nos. 17–19 exhibited by John K. Small, Ph. D. (Columbia University).

20. New Species of Gramineæ in the genera Panicum, Erianthus and Chloris, illustrated by specimens.

21. New Florida Plants in the genera Habenaria, Warea, Phaseolus, Glottidium, Cyrilla, Sida, Cornus, Monarda, Scoparia, Utricularia, Eupatorium, Lacinaria, Chrysopsis, Eriocarpum and Pluchea, illustrated by specimens.

Nos. 20 and 21 exhibited by George V. Nash (Columbia University).

22. Specimens and Microscopic Preparations illustrating studies on the moss genera Climacium and Entodon. Exhibited by A. J. Grout (Columbia University).

23. New Species and Varieties of Lathyrus and Vicia from North and Central America. Exhibited by Theodore G. White, A. M. (Columbia University).

24. Seven New Species of Plants from Texas, in the genera Samolus, Kuhnistera, Asclepias, Cressa, Verbena, Pentstemon and Houstonia.

These specimens partially represent the results of a revision of the genera.

25. Studies of the Flora of the Hawaiian Islands. Specimens illustrating numerous new and little-known species, collected during a visit to the Islands in 1895.

Nos. 24 and 25 exhibited by A. A. Heller (Torrey Botanical Club).

26. Specimens and Photographs illustrating a monographic study of the genus Physalis in North America, now in publication in Memoirs of the Torrey Botanical Club.

27. Studies in the Genus Potentilla. Specimens illustrating new and rare North American species.

Nos. 26 and 27 exhibited by Per Axel Rydberg, A. M. (Columbia University).

28. Two New Genera Collected by the Exhibitor in Bolivia. Rusbyella Rolfe, in the Orchidaceæ, and Rusbyanthus Gilg, in the Gentianaceæ.

29. Fifteen New Species of Rubiaceæ, collected in Bolivia by Miguel Bang.

Nos. 28 and 29 exhibited by Prof. H. H. Rusby, M. D. (College of Pharmacy.)

30. Critical Plants of the Local Flora. Exhibited by Eugene P. Bicknell (Torrey Botanical Club).

Specimens illustrating a special study of the local flora now in progress by the exhibitor. Illustrations from the genera Carex, Sisyrinchium, Hypericum and Helianthemum.

31. Additions to the Flora of New Jersey. Fifteen specimens. Exhibited by William Van Sickle (Torrey Botanical Club).

32. Additions to the Flora of Richmond County, New York.

These plants represent the species upon which was based the seventh appendix to the flora of Richmond County (Staten Island) New York, published by Arthur Hollick and N. L. Britton in 1879. The original catalogue contained about 1100 species. With the seven appendices the total now amounts to about 1400 species.

33. Leguminous Pods from the Yellow Gravel Sandstone at Bridgeton, New Jersey.

These pods represent the genera Mezoneurum and Lonchocarpus. They occur in sandstone of late tertiary or pleistocene age in the vicinity of Bridgeton, Cumberland County, New Jersey. The genus Mezoneurum is not

known on the American continent. The genus Lonchocarpus has not been recorded north of Mexico. The pods apparently represent species which became extinct in recent geologic time, due to the climatic changes wrought by the advent of the ice age.

34. Liriodendron Leaves, Fossil and Living.

The living tulip tree (Liriodendron Tulipifera) is the sole representative in our modern flora of this genus, which in the past included a large number of species. By means of abnormal leaf forms and leaves from young shoots or seedlings, an attempt is here made to compare the evolution of the individual with the evolution of the genus in the past, as evidenced by the variation in leaf forms during successive geologic periods.

Nos. 32–34, exhibited by Arthur Hollick, Ph. B. (Columbia University).

35. Colored Lantern Slides of Flowers. Exhibited by Cornelius Van Brunt (Torrey Botanical Club).

36. A Double Flowered Form of Rudbeckia laciniata. Exhibited by E. S. Miller (Torrey Botanical Club).

Although the plant has been in cultivation for two hundred years, this is the first record of a double-flowered form.

38. Essentials of Vegetable Pharmecognosy, a text-book on structural botany, especially designed for Pharmaceutical and Medical Students. Exhibited by Prof. H. H. Rusby, M. D., and Prof. Smith Ely Jelliffe, M. D. (College of Pharmacy).

40. A Copy of a Translation of Westerman's *Compendium der Botanik*. Exhibited by Albert Schneider, M. D. (Columbia University).

41. Volumes of the Bulletin and Memoirs Torrey Botanical Club for 1895. Exhibited by the Club.

ZOÖLOGY.

J

In Charge of William Stratford.

1. The Sea Life of the Pacific Salmon, (with specimens of young).

   The young Oncorhynchus return annually with the adults to the mouths of rivers, and do not remain at sea until sexually mature, as usually stated.

2. Living Ship Worm (Teredo navalis). A bivalve mollusc which destroys ships, wharves, &c., by boring tunnels in wood.

3. Living Tube Worms (Cistenides Gouldii) and others. Tube building worms.

4. Fishes new to this locality. Larimus and Elagatis, the runner.

   Numbers 1–4, exhibited by Tarleton H. Bean, New York Aquarium.

5. Larval stage of the Earthworm (Allolabophora fœtida). Exhibited by N. R. Harrington, Zoölogical Department, Columbia University.

6. Eggs of Thalasserna (A marine worm). Showing recent discoveries in Cytology.

7. I. The Origin of the Centrosome of the second polar spindle from that of the first.

   II. The Origin of the Centrosome of the second cleavage spindle from that of the first.

   Exhibited by Bradley B. Griffin, Zoölogical Department, Columbia University.

8. Nuclear Changes in Noctiluca (a Protozoan).

   Exhibited by G. N. Calkins, Zoölogical Department, Columbia University.

9. Studies in the Excretory System of Leeches.

   I. An Excretory Cell with its intra-cellular musculature.

   II. An Excretory funnel, showing structure of cells and cilia.

Exhibited by Arnold Graf, Zoölogical Department, Columbia University.

10. Preparations illustrating Karyokinetic cell division in the Egg of an Annelid (Nereis).

    Exhibited by E. B. Wilson, Zoölogical Department, Columbia University.

11. Eggs and Larvæ of Amia calva (the Mud-fish or Bow-fin).

    Exhibited by Bashford Dean, Zoölogical Department. Columbia University.

12. Mounted Asiatic Elephant "Tip," illustrating recent improvements in taxidermy.

13. Greenland Walrus, female and young calf, collected by Prof. L. L. Dyche, on the Peary Relief Expedition of 1895.

14. Shin and Skull of the fish-eating Rodent, Ichthyomys Stolzmanni Thomas, from Peru—the second known specimen.

15. Specimens of the Snowflake, Plectrophenax nivalis, illustrating change of color from the winter to the breeding dress by the shedding of the tips of the feathers.

16. Specimens of the Sanderling and Other Birds, illustrating the change of color by moulting in species alleged to acquire the breeding plumage by change of color in the feathers without moulting.

    Nos. 14–18, exhibited by Department of Mammalogy and Ornithology of American Museum of Natural History.

BACTERIOLOGY.

K

In Charge of F. M. Cheesman.

1. Culture of Bacillus. No. 41. Exhibited by Prof. H. W. Conn, Wesleyan University.

    Morphological preparations of Bacillus, No. 41. This bacillus, obtained originally from a specimen of milk

from Uruguay has been found to possess a marked power of ripening cream for butter making.

Experiments in various dairies have shown that the use of this bacillus for the production of flavor in butter is feasible and that a somewhat enhanced keeping property is given to the butter by the use of this culture.

ANATOMY.

L

In Charge of George S. Huntington.

1. Recent Observations in Human and Comparative Myology.
   - *a*. New and rare variations of the Pectoral Group in Man.
   - *b*. Morphology of the Sternalis Muscle; Relation of the muscle to the Structure of the Pectorales in Mammalia.

   Human M. Sternalis

   Pectoral muscles of Hydrochœrus capybara.
   " Enthizan dorsatus.
   " Dasypus sexcinctus.
   " Tatusia peba.
   " Manis macrura.
   " Viverra civetta.
   " Hapale jacchus.
   " Macacus nemestrinus.
   " Didelphis virginiana.

2. Anatomy of the Pectoral muscles in *Felis leo*. Exhibited by Mr. Line.

3. Myology of the Shoulder Girdle of *Lagothrix humboldtii*. Exhibited by Mr. Lee.

4. Myology of the Anterior Extremity of *Lemur bruneus*.

PALEONTOLOGY.

M

In Charge of J. L. Wortman.

1. Series of Skulls of Uintatheres, showing their development in time. From the Eocene of the Bridger Basin, Wyoming. Collected by Messrs. Wortman and Peterson, between 1893 and 1895. Also, from the Cope collection recently acquired by the Museum.
2. Two Skulls of a new and remarkable form of Titanotherium. From the Miocene of Dakota.
3. Skeleton of Hyrachyus Agrarius, one of the primitive Rhinoceroses. From the Eocene of the Bridger Basin, Wyoming. Mounted by Adam Herman.
4. Skull of an undescribed genus of ancient carnivores. From the Eocene of the Uinta Basin, Utah. Collected by Messrs. Wortman and Peterson, in 1895.
5. Teeth and Forefoot of the earliest ancestor of the Dog family. From the Eocene of the Uinta Basin, Utah. Discovered by Mr. Peterson in 1895.
6. Skull of a Monkey, Hyopsodus, Leidy. From the Eocene of the Washakie Basin, Wyoming. Discovered by Dr. Wortman in 1895.
7. Series of original restorations of extinct North American Mammals. Drawn by Charles R. Knight, under the direction of Prof. H. F. Osborn and Dr. J. L. Wortman.

   Nos. 1–7 exhibited by the Department of Vertebrate Paleontology Amer. Mus. Nat. Hist.
8. Eoördovician. Invertebrates from the Calciferous and Chazy formations of the Lake Champlain region. Collection of 1895. Exhibited by Gilbert van Ingen.

   Special features:

   a. *Ophileta* from Calciferous of Beekmantown, N.Y.

   b. *Trilobites* from Calciferous of Fort Cassin, Vt.

   c. Chazy fossils from Plattsburgh and Chazy, N. Y., and Highgate Springs and Basin Harbor, Vt.

GEOLOGIC TIME-SCALE (lower portion).

Names italicised indicate epochs, representatives of the fossil life of which are shown in exhibits Nos. 8, 9, 10 and 11.

	Neosilurian.	Lower Helderberg.
Silurian.	Eosilurian.	*Niagara.** *Clinton.* Medina.
Ordovician.	Neoördovician.	Hudson. *Utica.* *Trenton.* *Black River.* *Birdseye.*
	Eoördovician.	*Upper Chazy.* *Middle Chazy.* *Lower Chazy.* *Upper Calciferous.* Middle Calciferous. Lower Calciferous.
Cambrian.	Neocambrian.	Potsdam.

* Including Guelph and Salina.

9. NEOÖRDOVICIAN. Invertebrates from the Black River, Trenton and Utica formations of the Lake Champlain region. Collection of 1895. Exhibited by Theodore G. White. Special features:

a. Fossils indicative of particular zones of the Black River limestone from its lower to its upper limits, as:

1. *Leperditia* from base of the formation at Button Bay Island, Vt., and Chazy, N. Y.

2. *Strophomena filitexta* from Button Bay Island, Vt.

3. *Stromatocerium* and *Columnaria* from the above localities, forming at the former locality a coral reef band two feet in thickness.

4. *Maclurea*, a peculiar Black River species from Chazy, N. Y.

5. *Parastrophia*, from a restricted zone at the top of the Black River formation at Larabee's Pt., Vt., and also from 78 miles to the northward, at Highgate Springs, Vt.

b. Trenton—Selection of various representative fossils from the entire length of the lake shores, including some peculiar forms from Cumberland Head, near Plattsburgh, N. Y.

c. Utica—*Graptolites* from Larrabees Pt., Vt., and Ticonderoga, N. Y. *Lingula* and *Orthis* from Vergennes, Vt. *Triarthrus* and *Graptolites* from Isle la Motte, Vt.

10. Neoördovician—Fossils illustrating the sequence of the later Ordovician faunulæ at Trenton Falls, N. Y. Collections of 1895. Exhibited by Theodore G. White.

Special features:

a. Calciferous dolomite, dove limestone and fossils of the Black River limestone, from near Poland, New York.

b. Fossils from the original section from which the Trenton formation was named, arranged in zones as determined by a recent stratigraphic study by the exhibitor.

c. Utica *graptolites*, *trilobites* and *orthoceratites* from Nine Mile Creek, East Trenton, New York.

11. Eosilurian.—Fossils from the Clinton and Niagara formations of Rochester, New York. Exhibited by Gilbert van Ingen.

Special features:

a. *Graptolites*, *Brachiopods* and *Pteropods* from the red and green shales of the Clinton series.

b. Various fossils from the Niagara shale.

Note.—Photographic views and maps illustrating the localities from which were obtained the specimens of exhibits Nos. 8, 9, 10 and 11, will be found in the section of Geology.

12. A Stigmaria Fragment of exceptional size from Indian Territory. Exhibited by J. J. Stevenson.

13. Mollusca from the Asphalt Beds of Indian Territory. Exhibited by J. J. Stevenson.

ETHNOLOGY AND ARCHÆOLOGY.

N

In Charge of Franz Boas and M. H. Seville.

1. The Animal Form in the Art of Ancient Peru. From the collections of the American Museum of Natural History. Exhibited by Mr. Harlan I. Smith; collected by Mr. A. F. Bandelier.

   Representations of animal forms of pottery, painting, weaving, gold, stone and wood in the art of ancient Peru.

2. Portrait Heads in Pottery of Ancient Peru. From the collections of the American Museum of Natural History. Exhibited by Mr. Harlan I. Smith; collected by Mr. A. F. Bandelier.

3. Pathological Specimens from an ancient burial ground in Kentucky. From the collections of the American Museum of Natural History. Exhibited and collected by Mr. Harlan I. Smith.

   These specimens were excavated on the Fox Estate, May's Lick, Mason County, Ky., on an area of about forty acres. Part of them were found in stone graves, others in mounds, but both groups probably belong to the same people. Both sexes were equally subject to inflammation and suppuration of the bones, 19 among 55 adults (35%) being affected with it. The disease was rarely present in children and youths.

4. Burial Customs of a Prehistoric People of Utah. Collected and presented to the American Museum of Natural History by Messrs. B. T. B. and F. B. Hyde; exhibited by Messrs. B. T. B. Hyde and George H. Pepper.

This collection represents burial under baskets as practiced by a prehistoric people of Utah and was discovered by Richard Wetherill, of the Hyde Exploring Expedition during the winter of 1893–94.

5. Photographs of Pictographs from Utah. Collected and exhibited by Mr. B. T. B. Hyde.

6. Typical Collection of Material Found in an Indian Burial Place at Tottenville, S. I. From the collections of the American Museum of Natural History. Exhibited by Mr. George H. Pepper; collected by Messrs. George H. Pepper and M. H. Saville.

7. Collection of Ancient Pueblo Skulls. Exhibited and collected by Dr. Walter Fewkes, Washington, D. C.

8. Diagrams showing the Growth of Children in Various Cities of America. Exhibited by Dr. G. M. West.

9. Diagram showing the Difference in the Rate of Growth of First-Born and Later-Born Children. Exhibited by Mr. Franz Boas.

The diagram shows that first-born children develop physically better than later-born children. They are both taller and heavier than the latter.

10. Anthropometrical Charts. Designed and exhibited by Prof. W. Z. Ripley.

11. Phonographic Records of Indian Songs. Exhibited by Mr. Franz Boas.

Songs of Kwakiutl Indians of Vancouver Island, recorded in 1893.

12. The Beaver in the Art of the Indians of British Columbia. Exhibit of the Department of Anthropology of the American Museum of Natural History.

Showing the conventional forms in which the beaver is represented in carvings, etchings and paintings of the Indians of British Columbia.

13. Artificial Deformations of the Human Skull. Exhibited by Mr. Franz Boas.

The distribution of the practice of artificial deformation of the skull and specimens of deformations, together with photographs of living individuals with deformed heads.

14. Busts of Eskimo Man and Woman. Sculptured from life and exhibited by Mr. Caspar Mayer.

From the collections of the American Museum of Natural History.

15. Ten Albums of Photographs, illustrating the recent explorations of the ancient ruins of Copan, Honduras, under the direction of the Peabody Museum, Prof. F. W. Putnam, Curator of the Museum. Exhibited by Prof. F. W. Putnam.

16. Arrow Games in Asia and America. From the collections of the Museum of Archæology, University of Pennsylvania. Exhibited by Mr. Stewart Culin.

Illustration of the origin of playing cards and chess in the arrow, and hypothetical development of seal cylinder, Chinese coin, the folding fan.

EXPERIMENTAL PSYCHOLOGY.

O

In Charge of J. McKeen Cattell.

1. Pendulum Chronoscope; Electrical Color Wheel with Speed Indicator; Multiple Key; Clock Contact. Exhibited by Dr. E. W. Scripture, Yale University.

2. Pendulum Chronoscope. Exhibited by Prof. Charles B. Bliss, New York University.

3. Apparatus for Determining Photometric Differences by the time of Perception. Exhibited by Prof. J. McKeen Cattell, Columbia University.

NEW YORK ACADEMY OF SCIENCES.

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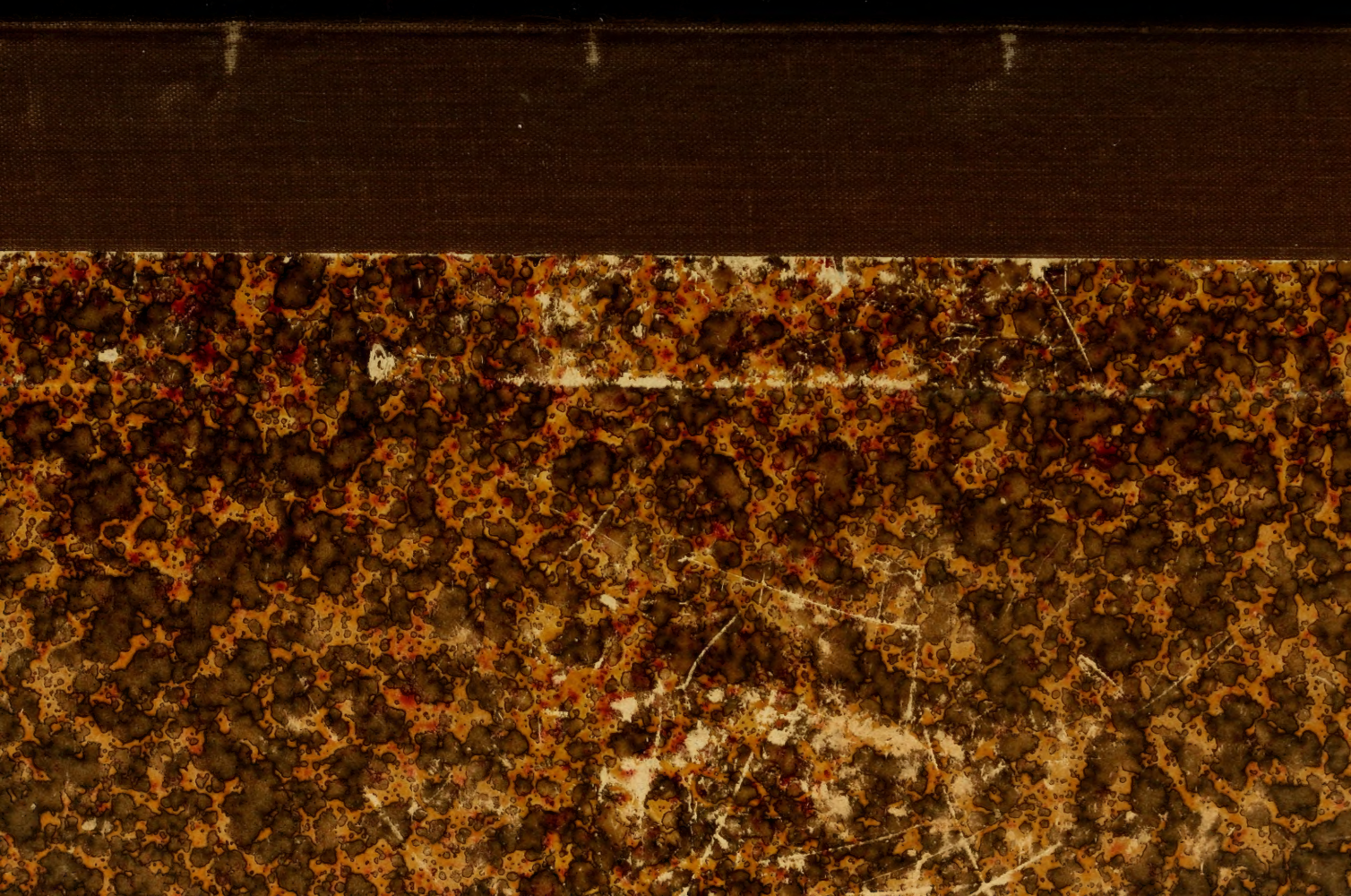
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